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Therefore, in order that the sum of the cubes of n consecutive numbers be a square, *the first number must be unity.*

When $n=2$, the numbers are 1 and 2; when $n=3$, the numbers are 1, 2, and 3; &c., &c.

Also solved by *Professor COOPER D. SCHMITT, and the PROPOSER.*

II. Solution by B. F. FINKEL, A. M., Professor of Mathematics in Kidder Institute, Kidder, Missouri.

Let $S=1+2+3+\ldots\ldots+n=(n+1)n/2$;

$S_2=1^2+2^2+3^2+\ldots\ldots+n^2=n(n+1)(n+2)/6$; and

$S_3=1^3+2^3+3^3+\ldots\ldots+n^3=?$

$$\begin{array}{rl}
\text{Now } (n+1)^4-n^4= & 4n^3+6n^2+4n+1 \\
n^4-(n-1)^4=4n^3-6n^2+4n-1= & 4(n-1)^3+6(n-1)^2+4(n-1)+1 \\
(n-1)^4-(n-2)^4=4n^3-18n^2+28n-15= & 4(n-2)^3+6(n-2)^2+4(n-2)+1 \\
(n-2)-(n-3)^4=4n^3-30n^2+76n-65= & 4(n-3)^3+6(n-3)^2+4(n-3)+1 \\
\ldots\ldots=\ldots\ldots\ldots=\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots & \\
5^4-4^4=\quad 369 & =4\times4^3+6\times4^2+4\times4+1 \\
4^4-3^4=\quad 175 & =4\times3^3+6\times3^2+4\times3+1 \\
3^4-2^4=\quad 65 & =4\times2^3+6\times2^2+4\times2+1 \\
2^4-1^4=\quad 15 & =4\times1^3+6\times1^2+4\times1+1 \\
1^4-0^4=\quad 1 & =4\times0^3+6\times0^2+4\times0+1 \\
\hline
\end{array}$$

Adding, $(n+1)^4=4S_3+6S_2+4S+n+1$.

$$\begin{aligned}
\text{Whence, } S_3&=[(n+1)^4-n-1-6S_2-4S]/4, \\
&=[(n+1)^4-n-n(n+1)(n+2)-2(n+1)n]/4, \\
&=[n^4+2n^3+n^2]/4=[\tfrac{1}{2}n(n+1)]^2.
\end{aligned}$$

If $n=2$, $S_3=9$; if $n=3$, $S_3=36$; if $n=4$, $S_3=100$; if $n=5$, $S_3=225$.

NOTE.—The above method is useful in summing the series: $1^r+2^r+3^r+4^r \cdots\cdots nr$, where r is any integer.

PROBLEMS.

32. Proposed by A. H. BELL, Hillsboro, Illinois.

Decompose into its prime factors the number 549755813889.

33. Proposed by M. A. GRUBER, A. M., War Department, Washington, D. C.

Find three different *sixth powers* whose sum is a square.

[The solution of this problem, if possible, is an answer to the *note* under the solution of Prob. 16.]